14 Pomona Lake

14.1 General Background

Pomona Lake was impounded in 1963 and reached full pool in 1965. The main water quality threats to Pomona Lake are sedimentation, nutrients and bacterial contamination. The lake is listed on the state's 2004 303(d) list for water quality impairment due to eutrophication and silt. Kansas State University has applied for a 319 grant to develop a Watershed Restoration and Protection Stragey (WRAPS) project in the Upper Marais des Cygnes basin. The Marais des Cygnes Basin Advisory Committee has begun efforts to develop a watershed management plan and protect the watershed for current and future water needs.

14.1.1 Location

Pomona Lake is located approximately 48 km (30 miles) south of Topeka, Kansas. The dam is located at river km 13.3 (river mile 8.3) on 101 Mile Creek, a tributary of the Marais des Cygnes River. The watershed includes portions of Osage and Wabaunsee counties. Historic water quality sample sites at Pomona Lake include 3 lake, 1 outflow, and 1 inflow (Figure 14.1).

Figure 14.1. Pomona Lake area map with sample site locations.

14.1.2 Authorized Purposes: Flood damage reduction, recreation, water quality improvement, and fish and wildlife management.

14.1.3 Lake and Watershed Data

Pools	Surface Elevation (ft. above m.s.l.)	Current Capacity (1000 AF)	Surface Area (A)	Shoreline (miles)
Flood Control	1,003	176.1	8,522	
Multipurpose	974	64.2	3,871	52
Total		240.3		

Total watershed area: 322 sq miles (206,080 A)

Watershed ratio: 24.18 FC / 53.24 MP

Average Annual Inflow: 143,721 acre-feet
Average Annual outflow: 000 acre-feet
Average flushing rate:
Sediment inflow (measured): 7,045 acre-feet (1963 – 1989)

14.2 2005 Activities

Pomona Lake was categorized as an 'intensive' lake during 2005, with sample collection occurring from May through September. Surface samples were to be collected from inflow and outflow sites, while surface and bottom samples were collected at three lake sites. Vertical profiles (temperature, DO, pH, conductivity, and turbidity) were recorded at the three lake sites during each monthly sampling trip. Pomona Lake staff (OF-PO) providing field assistance with the WQP during 2005 included David White and Brad Cox. David Green, OF-PO Operations Manager, provided technical insight and background knowledge on Pomona Lake and surrounding watershed.

14.3 2005 Data

Comparative historic data consists of monthly (April – September) data collected from 1996 , 1997, 1999 – 2005.

14.3.1 Inflow

Inflow samples were collected from Dragoon Creek at Hwy 56 during 2005. All data is discussed in context with lake samples below.

14.3.2 Lake

Based on total nitrogen (TN), total phosphorus (TP) and chlorophyll *a* concentrations, Pomona Lake is classified as eutrophic. Monthly and annual variability in total nitrogen is evident at all sites (Figure 14.2 is an example from Site 3). Median concentrations range from 0.95 – 1.0 (Figure 14.3) for the three lake sites, which exceeds EPA's proposed ecoregional nutrient criteria value of 0.36 mg/L total nitrogen. Median TP concentrations ranged from 0.08 – 0.1 mg/L (Figure 14.4), which exceed EPA's proposed nutrient criteria value of 0.02 mg/L TP. The measured values for TN and TP are typical for reservoirs within the district.

The ratio of TN:TP can be used as a surrogate to determine the dominant algal community within a waterbody. Ratios $\geq$ 20:1 are indicative of desirable algal

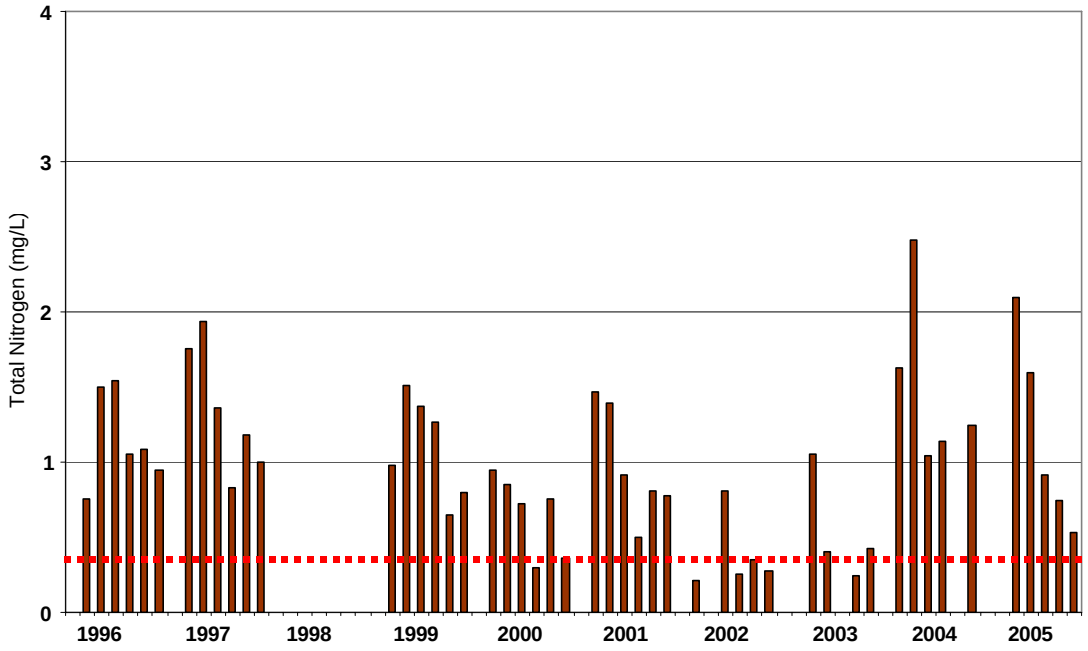


Figure 14.2. Total nitrogen concentrations by sample data collected at Site 3 (Tower) from 1996 through 2005 in Pomona Lake.

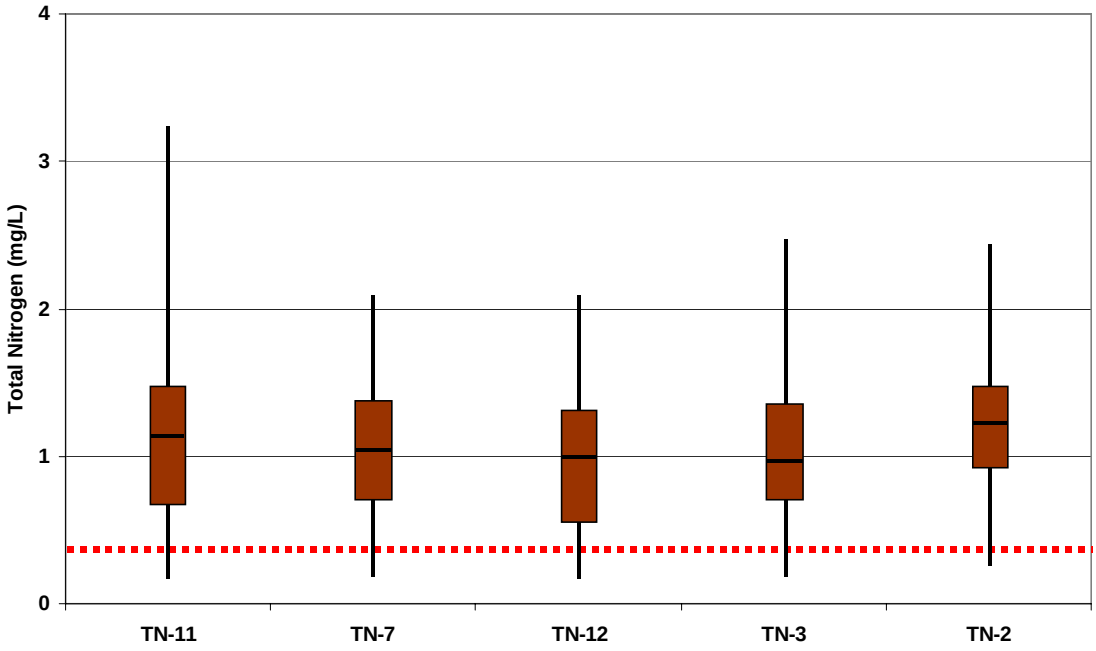


Figure 14.3. Box plots of surface water sample total nitrogen concentrations measured at inflow, lake, and outflow sites from 1996 through 2005 at Pomona Lake.

communities, whereas ratios ≤ 12:1 are indicative of bloom-forming cyanobacteria (blue green algae). As would be expected, there is high monthly and annual variability in the TN:TP ratio at all sites; see Figure 14.5 as an example at Site 12. Median TN:TP ratios at all three lake sites are < 12, indicating the lake is at risk for cyanobacteria blooms (Figure 14.6).

Total iron exceeded EPA's Drinking Water Standard of Secondary Maximum Contaminant Levels (SMCL) of 300 ug/L from surface samples collected during August at both the inflow (Site 11) and outfall (Site 2) sample locations. Concentrations ranged from 1031 – 1435 ug/L, with the highest concentration recorded at Site 11. Implications are directed at drinking water facilities related to taste and staining issues. In addition, surface samples collected from both Sites 11 and 2 during August exceeded EPA's SMCL for manganese (50 ug/L). Sample concentrations ranged from 141 – 143 ug/L. Implications are directed at drinking water facilities due to taste and stain issues.

Mean chlorophyll a concentrations ranged varied greatly by site during the September sampling trip. Concentrations of 12 and 21 ug/L were measured at Sites 3 and 12, respectively, while a concentration of 96 was measured at Site 7. It should be noted that a visible blue-green algal bloom was occurring during this time at the site. Secchi depth, measured during June, July and September, indicated limited water clarity at all lake sites (range= 0.24 – 0.69 m). Lowest water clarity during the year was measured at Site 7.

Median atrazine concentrations in Pomona Lake, ranging from 0.9 – 1.6 ug/L, are less than EPA's drinking water maximum contaminant level (MCL) of 3 ug/L (Figure 14.7). However, individual samples measured since 1996 have been significant enough to exceed the MCL – even exceeding 8 ug/L at Sites 12, 7 and 2 during 2005! Figure 14.8 depicts annual variability in atrazine concentration by sample date at Site 11 (inflow).

Vertical profiles were recorded during sample trips in June, July and September 2005. Parameters included temperature, dissolved oxygen, pH, conductivity, and turbidity. Based on these profiles, the lake was weakly stratified thermally between 5 - 6 m in depth during June and July (Figure 14.9). Chemically, lake stratification was more pronounced between a depth of 4 – 5 m during June before exhibiting signs of destratification during late-September.

14.3.3 Outflow

Outfall samples were collected from Pomona Lake during 2005. All data is discussed in context with the lake samples above.

14.4 Future Activities and Recommendations

Sampling activities for 2006 will include transition from 'intensive' to 'ambient' monitoring from May through September, as well as conducting at least one summer vertical profile at each of the three lake sites.

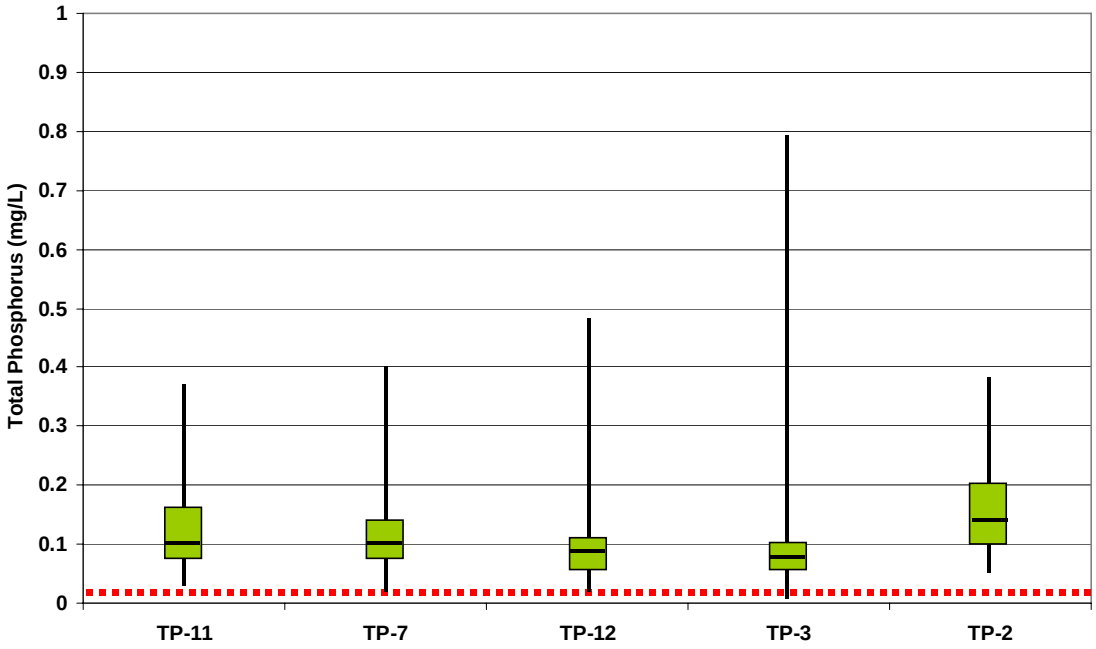


Figure 14.4. Box plots of surface water sample total phosphorus concentrations measured at inflow, lake and outflow sites from 1996 through 2005 at Pomona Lake.

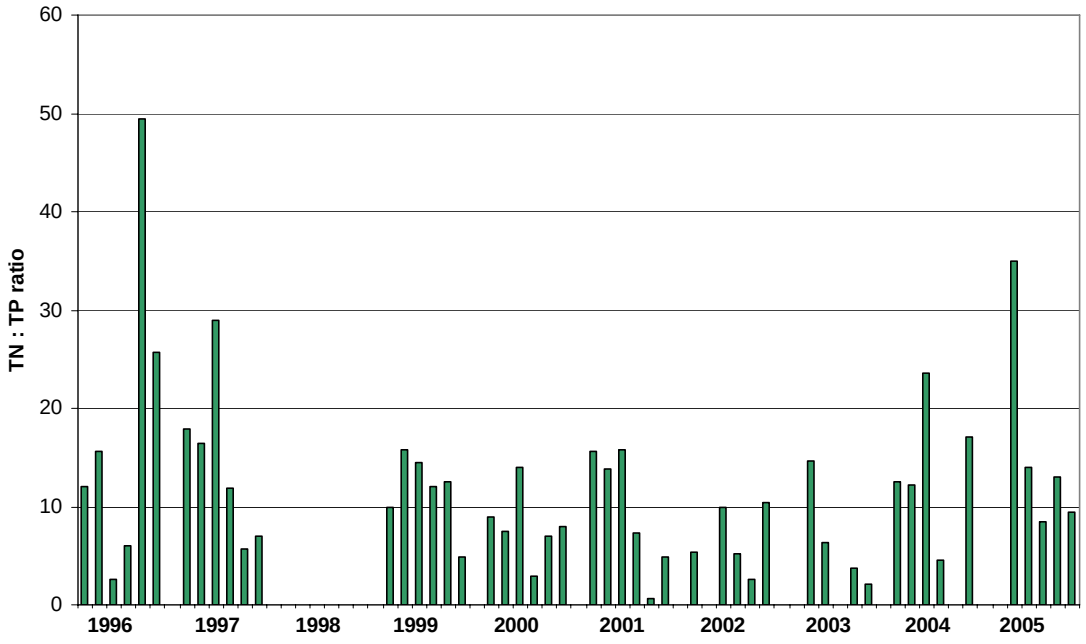


Figure 14.5. Graph of total nitrogen : total phosphorus (TN : TP) ratio by sample date at Site 12 in Pomona Lake from 1996 through 2005.

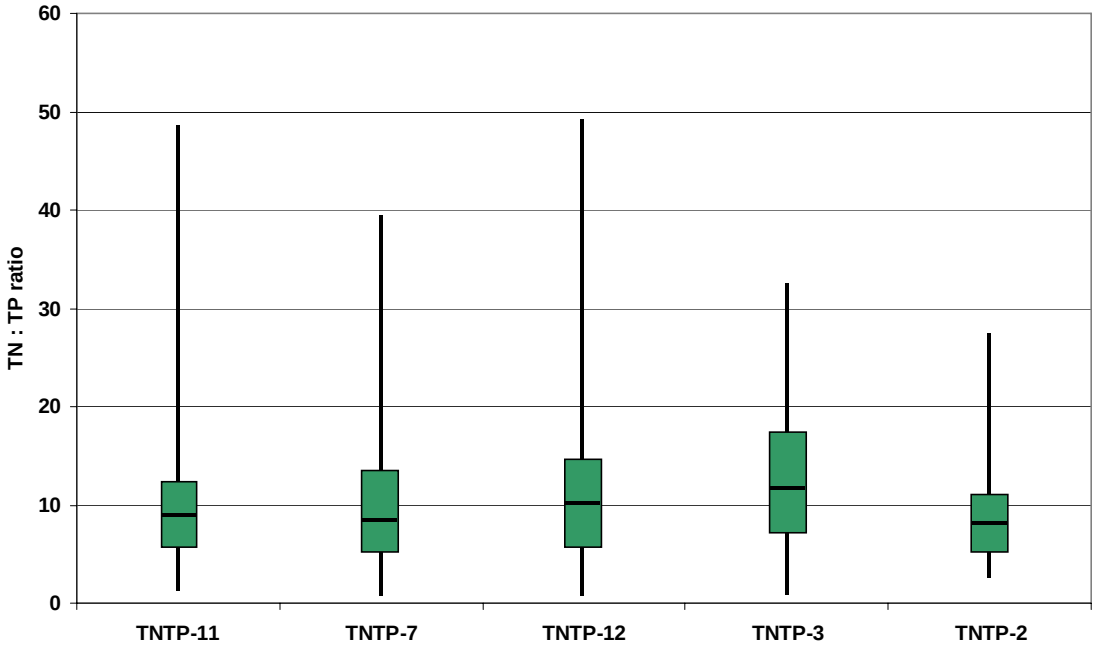


Figure 14.6. Box plots of total nitrogen : total phosphorus (TN : TP) by site from 1996 through 2005 at Pomona Lake.

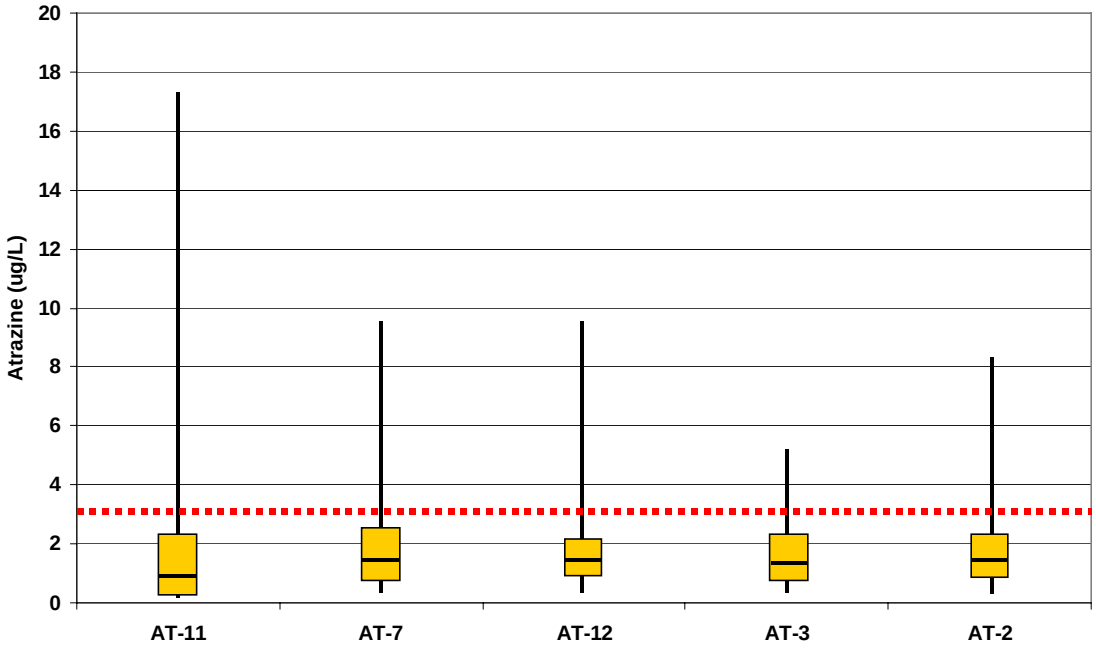


Figure 14.7. Box plots of surface water sample atrazine concentrations measured by site from 1996 through 2005 at Pomona Lake.

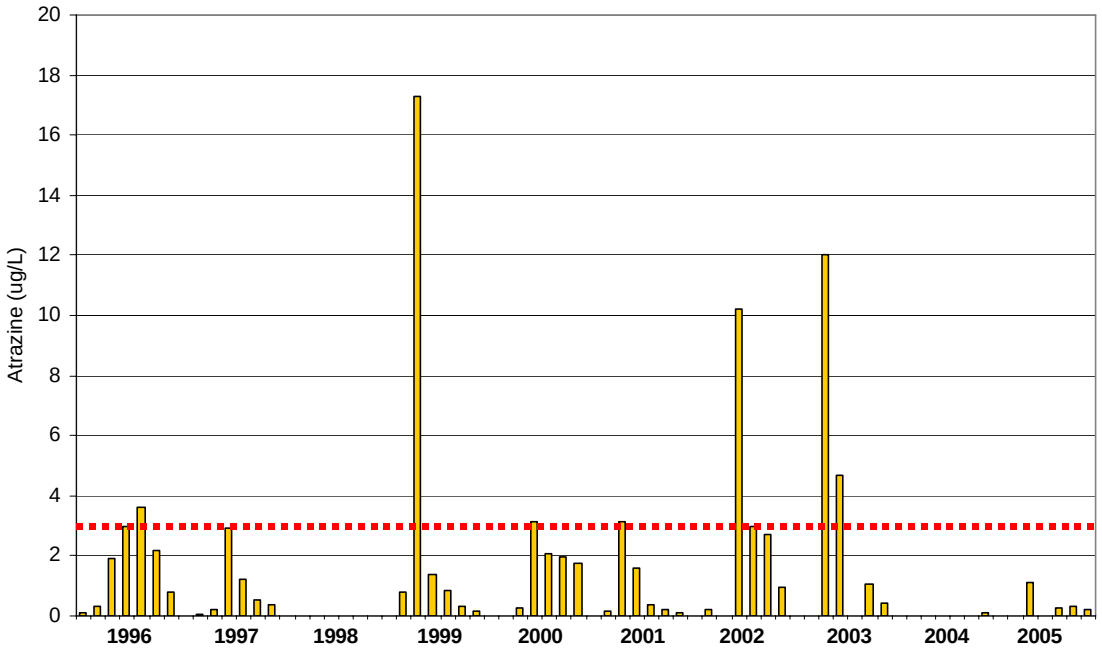
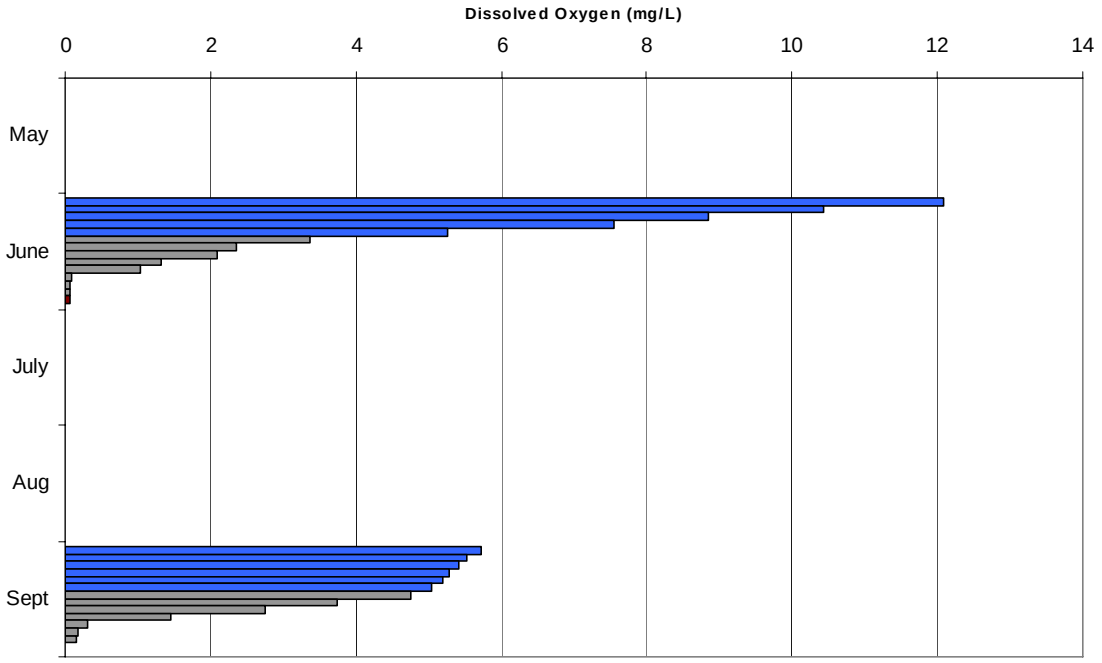


Figure 14.8. Atrazine concentrations by sample date from surface water samples collected at Site 11 (inflow) of Pomona Lake between 1996 and 2005.



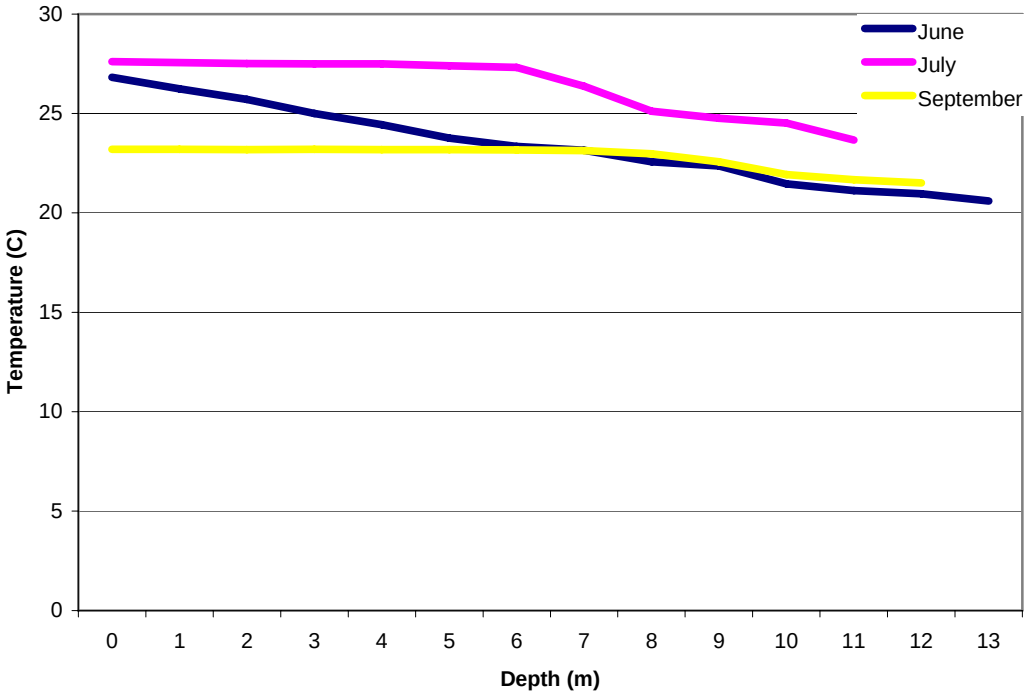


Figure 14.9. Dissolved oxygen concentration (mg/L) histogram and temperature (°C) Plot from vertical profiles recorded at Site 3 (Tower) during June, July and September 2005.